

## Focus On...

### The Office of Fuels Development

Welcome to *Biofuels News*, a quarterly newsletter from DOE's Office of Fuels Development (OFD), a division of the Office of Transportation Technologies (OTT). OFD develops technologies for biofuels (primarily ethanol and biodiesel), and works with industry to support the demonstration of the technologies.

*Biofuels News* focuses on DOE-driven biofuels activities. This issue is dedicated to the use of biofuels and the global climate change debate.

OFD's biofuels research and development (R&D) efforts are led by two federal laboratories: Oak Ridge National Laboratory (ORNL) and the National Renewable Energy Laboratory (NREL). ORNL's Biomass Energy Feedstock Program focuses on the R&D of fast-growing biomass feedstocks that can be converted to transportation fuels. NREL's Biofuels Program researchers develop technologies that convert dedicated crops and other biomass feedstocks to ethanol. The efforts of both laboratories have resulted in many improvements in biofuels process technology.

DOE's Regional Biomass Energy Program (RBEP), furthers the biofuels commercialization efforts by coordinating and fostering biofuels R&D, production, and use on a regional level. The RBEPs promote the production and use of biomass-derived fuels and energy by providing technical information and other assistance and by removing barriers to the demonstration of biomass energy technologies.

Listed below are the five Regional Biomass Energy Program offices:

Southeast Region  
Contact: Philip Badger  
Phone: 205.386.3086

Northwest Region  
Contact: Jeff James  
206.553.2079

Northeast Region  
Contact: Richard Handley  
Phone: 202.624.8454

Western Region  
Contact: Jeff Graef  
Phone: 402.471.3218

Great Lakes Region  
Contact: Fred Kuzel  
Phone: 312.407.0177

## Special Interview

Our "Focus On" section features a special interview on global climate change issues with OFD director John Ferrell. We asked for his thoughts concerning the global climate change conference in Kyoto, Japan, and how it might influence OFD programs.

BN: How will OFD programs be affected by global climate change?

JF: I foresee that global climate change will be a main driver for OFD biofuels efforts because ethanol and biodiesel are the only liquid transportation fuels that involve carbon recycling, which has an obvious advantage from the climate change perspective. It is my hope that funding for the program will increase because of this attribute. (See "Two Federal Laboratories Work to Reduce Greenhouse Gas Emissions," p. 3.)

BN: How might the outcome of the Kyoto conference affect biofuels and OFD, both in the near and long terms?

JF: If emissions are reduced to 7% below 1990 levels, we would see near-term changes. One approach to reducing greenhouse gases could be to displace fossil-derived gasoline with ethanol by blending a small amount of ethanol (say 10%) into every gallon of gasoline. With more than 1 trillion miles traveled on 10% ethanol/gasoline blends, U.S. drivers are becoming comfortable with using fuels that contain ethanol. Also, research dollars might be increased, which could accelerate ethanol's ability to compete in the marketplace.

There could be support for a long-term option to increase the widespread use of fuel, chemicals, and electricity from biomass sources to lower greenhouse gas emissions to 1990 levels. Additionally, because of the need to increase the supply of biofuels (more biomass feedstocks will be required to meet the potential increased demand), a long-term vision may be to increase the focus of DOE and USDA on energy crop development.

BN: How will the global warming issue affect the continued development and commercialization of biofuels?

JF: Federal, state, and producer incentives might be developed to accelerate the deployment of biomass-based products.



BN: Do you think the increased interest in global climate change issues will have a positive effect on OFD funding?

JF: Yes. The FY 1999 budget could be increased because of the potential of newly created projects. In order to help meet the emission reduction levels put forth by the Kyoto treaty, a larger effort to demonstrate the biomass ethanol technologies will be needed in the near term.

BN: Public awareness of alternative fuels has recently increased. Do you think Kyoto and global climate change issues in general will sustain public awareness and increase interest about alternative fuels?

JF: I am hopeful. A concerted effort will be needed to keep this issue in front of the public. It will depend on efforts from many groups, including environmental and scientific communities, major oil companies, decision makers, auto manufacturers, fuel producers, and industry at large.

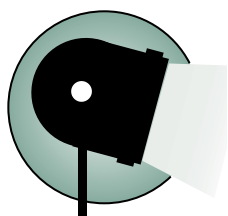
BN: How do you think the global climate change issue, or the outcome of Kyoto, will affect program integration in OTT?

JF: Program integration between fuels and vehicles could become stronger. This could be achieved by using vehicles with efficient propulsion systems and fueling these vehicles with alternative fuels that may reduce greenhouse gas emissions even further; for example, highly efficient, ethanol fuel-cell powered vehicles.

BN: Where do you see OFD project development heading in the next 5, 10, or 20 years?

JF: We hope to reach our goal of supporting projects to make ethanol from biomass by the year 2001. If a number of projects can demonstrate the technology, a new industry may be born.

Within 10 to 15 years we could see transportation fuel from sawdust, rice straw, and corn fiber. We may begin to see a major shift in the agricultural system to produce larger quantities of biomass for biofuels feedstock uses. We project that the ethanol industry could grow to 12 billion gallons by 2020.



### *In the Spotlight...*

#### **BCI to Construct Biomass-to-Ethanol Production Facility**

Jennings, Louisiana—With support from DOE's Office of Fuels Development (OFD), BC International



### *Did you know?*

#### **Biofuels Program on the World Wide Web**

Biofuels Information Center ([www.biofuels.nrel.gov](http://www.biofuels.nrel.gov))  
The National Renewable Energy Laboratory (NREL) operates the Biofuels Information Center. This site has NREL's R&D efforts, including issues of *Biofuels News* (formerly *Biofuels Update*), fact sheets, and technology briefs, all of which can be downloaded in minutes.

Bioenergy Information Network ([www.esd.ornl.gov/bfdp](http://www.esd.ornl.gov/bfdp))  
The Bioenergy Information Network is supported by DOE's Office of Energy Efficiency and Renewable Energy. The site helps you find information about liquid and gaseous fuels produced from renewable feedstocks. From this location you can access three databases that provide biofuels information, Regional Biomass Energy Programs, and project summaries that allow you to track ongoing research. The site is very large but easy to navigate. It is a definite bookmark for anyone interested in sources of renewable energy.

#### **Upcoming Conferences and Events**

20th Symposium on Biotechnology for Fuels and Chemicals  
May 3–7, 1998  
Gatlinburg, Tennessee  
Contact: Brian Davison.....423.241.3800

Fourth National Clean Cities Stakeholders Conference  
& Exposition  
May 31–June 3, 1998  
Washington, DC  
Contact: Clean Cities Hotline.....800.CCITIES

1998 Windsor Workshop on Alternative Transportation Fuels  
June 8–10, 1998  
Toronto, Ontario Canada  
Contact: Susan Horton.....905.822.4111, ext. 515

14th Annual Fuel Ethanol Workshop International  
June 29–July 1, 1998  
South Bend, Indiana  
Contact: Bryan & Bryan.....719.942.4353

Corporation (BCI) plans to open a biomass-to-ethanol facility. It could be the first facility operational in the world that uses genetically engineered fermentation organisms to convert hemicellulose sugars to ethanol. Construction on the plant, a former molasses-to-ethanol facility, will begin this summer; the facility should be operational by the middle of 1999. This facility is a major milestone on the road to biomass ethanol commercialization. The initial ethanol production goal is 10 million gallons per year; the ultimate goal is 25 million gallons per year.

*"We are excited about the wide-ranging potential of this breakthrough technology. It addresses a number of environmental, energy, strategic, and economic issues, including dramatic reductions in greenhouse gases. This enabling technology would not be ready if it weren't for the long-term R&D commitments by agencies such as DOE and USDA, and by DOE's partnering with companies such as BCI to bring these types of advances out of the laboratory and into the mainstream where commercial application can become a reality. Beyond just the United States, we are also excited about how this technology will greatly improve the quality of life across the entire planet."*

*—Steve Gatto, president of BCI*



## Fueling the Environment

### Two Federal Laboratories Work to Reduce Greenhouse Gas Emissions

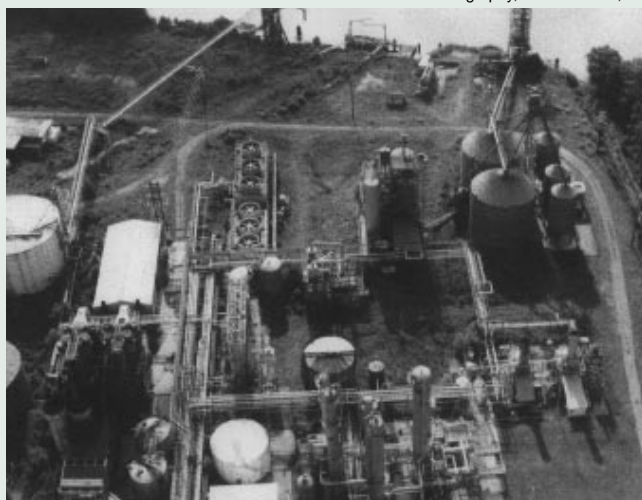
As the world consumes fossil fuels at an alarming rate, new carbons are continually released into the atmosphere. These carbon emissions are greenhouse gases that may cause global climate change. Carbon moves through a cyclic process, known as the carbon cycle, whereby the carbon in the atmosphere is adsorbed by plants. The plants use carbon to make new cells for growth. When the plant dies, most of its carbon is returned to the atmosphere by decaying organisms. Ethanol production from biomass takes the carbon that would be returned to the atmosphere by decaying organisms and routes the carbon into ethanol. The ethanol then can be used in a vehicle motor fuel, which converts the carbon to carbon dioxide. The carbon dioxide produced by the vehicle from the ethanol is the same quantity that natural decay of the original biomass produces. Use of gasoline or other fossil fuels in motor vehicles results in release of carbon to the atmosphere that would not be there otherwise. This release of "new" carbon is responsible for the global climate change concern. Ethanol emits no "new" carbon. The carbon released during ethanol combustion was previously captured from the atmosphere during plant growth. It is then recycled from the atmosphere by plants used as feedstock for ethanol, then back to the atmosphere when the ethanol is burned.

Ethanol use is an effective solution to the greenhouse gas problem, but many challenges must be overcome before its full potential is commercially realized. The biggest challenge is for ethanol to be economically competitive with gasoline. Two federal laboratories, Oak Ridge National Laboratory (ORNL) and the National Renewable Energy Laboratory (NREL) are driving biomass-based ethanol to commercialization and to cost competitiveness with gasoline through their R&D efforts.

ORNL researchers have successfully developed fast-growing, high-yield trees and perennial grasses for conversion to ethanol. "Higher yields mean a lot to farmers who have to worry about the bottom line and measure economic success by the bushels and tons sold," says Janet Cushman, manager of the Biofuels Feedstock Development Program at ORNL. "ORNL has been developing working group partnerships with farmers to validate these yields under real-world conditions. ORNL's R&D successes are steadily closing the commercialization gap for the use of dedicated biomass feedstocks."

The primary feedstock will be bagasse, the waste product from manufacturing sugar from sugarcane. The facility will also be able to make ethanol from other biomass feedstocks, such as rice straw and sawdust. Biomass feedstocks for ethanol create markets for waste that traditionally would have been burned or landfilled. New feedstock development presents additional market opportunities and crop diversity to farmers. For more information contact Steve Gatto, BCI (617.461.5700).

Air Bear Aerial Photography, Lake Charles, LA



**The BCI plant (above) will be the first of three biomass-to-ethanol plants scheduled for construction in the near future. Arkenol plans to produce ethanol by converting rice straw in California's Sacramento Valley, and Masada Resources Group is planning a municipal solid waste-to-ethanol production facility in New York state. For more information, contact Mark Carver, Arkenol, Inc. (714.454.4216) or Rob Minor, Masada (205.320.1888).**



The NREL Biofuels Program mission is to develop lower cost technologies for conversion of biomass (such as the energy crops created by ORNL) into ethanol. "The conversion must be as inexpensive and efficient as possible in order to make ethanol competitive with gasoline," said Art Wiselogle, senior project coordinator of NREL's Biotechnology Center for Fuels and Chemicals. "NREL's Biofuels Program has passed many technical milestones in support of near-term commercialization." NREL scientists and engineers have participated in pilot technology demonstrations using the DOE/NREL pilot plant in Golden, Colorado. Researchers are continuing to reduce ethanol production cost by engineering new fermentation organisms, identifying better cellulase enzymes, designing more efficient pretreatment reactors, and adding value to the lignin material by converting it to fuel components. This continued progress will lead to an economically viable alternative to conventional gasoline.

As America faces the challenge of reducing greenhouse gas emissions, ethanol is one of the innovative and healthy options the United States can use to meet environmental challenges.



### On the Federal Front...

#### Effect of the Kyoto Conference on Renewable Energy

The United Nations (U.N.) Framework Convention on Climate Change in Kyoto, Japan, is over, so it is up to Congress to ratify the Kyoto Protocol, which requires a 7% reduction in greenhouse gases by 2012 compared to the 1990 baseline.

Before the conference, the U.S. Senate passed a resolution (SR 98), expressing concern about the conditions

for the United States becoming a signatory to any international agreement on greenhouse gas emissions under the Convention. SR 98 requires commitments of "meaningful participation from developing countries" in order for the United States to take an active role in a global agreement. This language was not included in the Kyoto Protocol. Thus, the Kyoto agreement might not pass Congress. Another issue was the number of greenhouse gases to include in the agreement. The U.S. pushed to have all six greenhouse gases (carbon dioxide, methane, nitrogen oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) included in the protocol to provide a comprehensive reduction effort.

President Clinton's Climate Change Proposal, released October 22, 1997, was the foundation for U.S. negotiations throughout the conference. The main focus of the proposal was to implement "binding and realistic" greenhouse gas emission reduction targets that reach 1990 emissions levels by 2012. The proposal included a \$5 billion program of tax cuts and research and development for new energy-efficient technological advances. The proposal states that, "One-third of the nation's carbon dioxide emissions come from the transportation sector, primarily cars. Powering the fuel cell with renewable fuels, such as ethanol, we could eliminate the automotive greenhouse gas emissions entirely in the long run." It also mentions how DOE's five-laboratory study illustrates many exciting technologies that produce win-win solutions to reducing carbon emissions. President Clinton reinforced this effort January 27, 1998 in his state of the Union address, "I propose \$6 billion in tax cuts and research and development to encourage innovation, renewable energy, fuel-efficient cars and energy-efficient homes."

The next gathering of the Conference of the Parties (states that have ratified the treaty) to discuss the provisions of the Kyoto Protocol will take place in Buenos Aires, Argentina, in November 1998.

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National Biofuels Program • Office of Fuels Development  
U.S. Department of Energy • 1000 Independence Ave., S.W.  
Washington, DC • 20585



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